A Better Approach to Technological Solutions through a Uniform Computing Model

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Revision Notes

April 11, 2002 – Changes made to reflect concurrency with the CORE Metatecture Specification, clarification of market issues, as well as minor typographical errors.

Abstract

This document serves as a semi-technical introduction to an improved computing experience through the use of Zeratec's CORE Metatecture – a holistic specification that encompasses the descriptive science, governing structures, and physical implementation of synthetic existence and informatic processes within an artificial realm, commonly referred to as the Collective Open Resource Environment (CORE). It also provides an introductory description of the company's business model and the strategies and rationale involved.

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Introduction

There has never been a shortage of great ideas in the world. The challenge of business is to turn those great ideas into profitable ventures. More often than not, business models of high-tech companies center around the exploitation of "lesser" ideas – that is the extension of current trends for short-term gains. The cost and risk of dramatic change is often too much for companies to endure. However, it is in those few ventures – the ones that commit themselves to excellence and greatness – that come some of the most enduring and beneficial rewards.

Zeratec is one of those few ventures. Founded over five years ago, and envisioned well before that, this company took on the challenge of creating a new approach for developing computing and communications technologies. Going well beyond the ideas called for in the next-generation World Wide Web, Zeratec has discovered the means to overcome elusive technology problems that have gone unsolved for almost 30 years. The intense research efforts left no stone unturned – examining the successes and failures of other companies and their technologies.

The company had the good fortune of demonstrating some of its capabilities to the U.S. Army in 2000 and 2001 through small contracts. Even with limited features, it was clear that Zeratec was breaking ground in uncharted territory, as attested to by those who received these efforts. The calls of corporate, military, and government leaders for a seamless computing infrastructure – a universal platform for the accumulation and distribution of knowledge – can be achieved. Zeratec can enable this foundation and bring businesses and technologies to common ground.

Seeing the Unobvious

Web-related solutions being offered today are quite logical; they reach to fill a clear and immediate need. But to study the lasting impact of these developments is to understand how the *customer's* needs are overstressing the economic and technological capabilities of the product-producing infrastructure. Consumers are unwilling to pay premium prices for expanded products, yet technically these products must cost more to produce because of the underlying limitations of the tools with which product manufacturers work. As profits for these companies decrease, their ability to innovate becomes stifled – eventually raising risk factors to unacceptable levels.

Zeratec appreciates the needs of the consumer, but it is the *product manufacturers* who ultimately are most in need of a new solution. Without an improvement in their condition, the high-tech market's "house of cards" will tumble over and create devastating losses to innovation and competition. To address the needs of the high-tech consumer is to better equip the companies that provide consumer products and solutions.

Simply put, Zeratec looks to offer product manufacturers and solution providers with the tools necessary to build high-quality, interoperable, cost-efficient products and put these companies on course for greater profitability. However, to do it right – and to reap the highest reward for all – the tools must be more than short-term "band-aids." The Zeratec offerings must be based on forward-looking technology that breaks the risk-inducing consumer cycle.

Planning from the Bottom, Up

Better equipping product makers began over five years ago with an aggressive technology vision. Zeratec asked the question,

> *"If you could start with a blank slate, knowing what you now know, what would computing and communications look like?"*

It's a radical question, but one that cannot be avoided. Great advances in technology have occurred and continue to emerge, but mostly by chance and niche-oriented need. What Zeratec implies is that the science as a whole is now in a position to bring order to the chaos. The answer to this question was to design from the bottom, up. The technological rationale was straightforward:

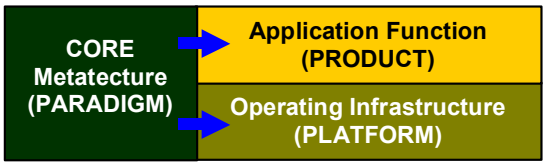
- **The overall state of technology is fragile.** Underneath today's solutions is a "layered sediment" where the strength of the offering is as weak as the layers it was built upon. Despite their glossy appearances, the foundations of these products are made of sand, not granite.
- **The overall capability of technology is limited.** General movement of applications and solutions towards the Web brings limitations in that the Web was not originally designed for most of the "features" being pushed today. Extensions to this functionality are "band-aids" at best.

DESIGN OBJECTIVES

In order to improve the general state and capability of technology, Zeratec understood that it would need to develop a new paradigm for computing and communications – a blueprint for use in product development that would apply well to any challenge. In creating this new blueprint, the company engaged the following key criteria:

- Provide holistic treatment of the computing and communications condition through a universal framework that would accommodate all current and future innovations and features. *(translation: make the blueprint encompass all the topics of other designs and standards, such as security, identification, etc.)*
- Normalize the technology and application container structures so that all entities exist in a similar form, allowing for recursion and compounding. *(translation: make it possible for any type of application, hardware, software, operating system, device, and so forth to combine in any way)*
- Standardize the interaction and interface between all technology and application entities such that basic interoperability and ubiquitous computing is achieved. *(translation: make every system and system component speak the same language and create universal compatibility)*
- Account for the human issue and provide anthropoidal entities that serve as a universal representative of a person, thereby accommodating the ownership, inclusion, learning patterns, and so forth. *(translation: channel human activity through a an object that represents everything they digitally own and have access to, creating extreme security, single sign-on, and extreme customization)*

From these design objectives and others, Zeratec created the CORE Metatecture – a comprehensive blueprint for the design and development of technology-oriented products and solutions. As shown in the figure below, the CORE Metatecture applies to both the products that are built as well as the underlying infrastructure.



The CORE Metatecture is a standard for both applications and infrastructure

The CORE Metatecture specifies an object model that allows data, applications, devices, and so forth to all interact in a similar manner. This provides the basis for total interoperability. The specification further defines the methods of *contextuality* that give each CORE object meaning so that proper understanding between technologies can occur without human intervention. Because this level of ontological activity applies to both data and programs, a highly ubiquitous and intelligent environment is achieved.

To accommodate the needs of CORE objects, the CORE Metatecture specifies the characteristics and requirements of CORE-compliant infrastructure. The "platforms" that support CORE objects are highly advanced in capability, providing several strategic features, and work in conjunction with the CORE objects to establish extreme levels of security and authentication.

The CORE Metatecture is at the heart of every Zeratec offering and it provides a competitive and technological advantage. It is the guiding model and standard for development of CORE-compliant products. It is not a programming language, but rather a methodology that all programming languages can adopt.

A Brief History of Computing

To appreciate the power of the CORE Metatecture, consider the world around us. Technology is at work in almost every aspect of life. Yet, technology has not lived up to its original intentions. It was supposed to make life easier. It was supposed to serve the needs of people almost effortlessly and disappear "into the woodwork" where it could be taken for granted. Instead, it acts as the single largest contributor to the frantic pace of life. It is as though people have become servants to technology and the products that it affects.

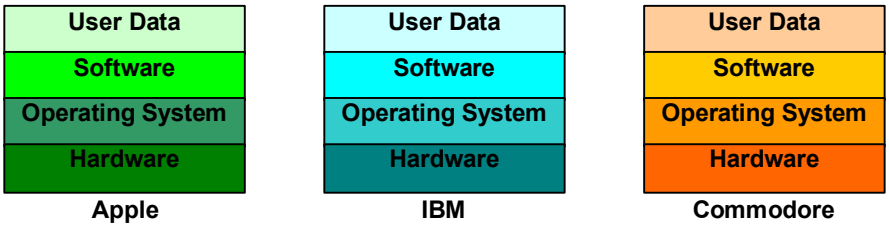
A CONTINUING PROBLEM

In understanding why the plans and expectations for technology have gone astray, it is appropriate to recognize the entire base of contributing factors. Previous plans have faltered at the same place most great ideas do – the

intersection of technical potential, political agendas, economic realities, proprietary jealousy, and people resistant to progress (also known as the "Dilbert Principle"). Consider the great VHS/Beta video format debates as an example. It is said that Beta was the superior technology, yet VHS prevailed. To the casual observer, this was a failure of common sense. But the reality was that other non-technical factors such as marketing and human resource issues helped to promote VHS to the winner's circle. The computer industry itself is filled with products that claim the largest market share, but are not necessarily the best offerings, technologically speaking.

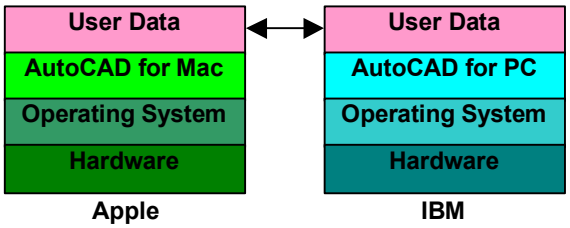
PROGRESS IN THE COMPUTER INDUSTRY

When the personal computing industry first emerged around 25 years ago, it resembled the VHS/Beta situation. All of the computer systems offered were originally totally *proprietary* and not even the user's data could be transferred to another type of computer. This lack of *compatibility* meant that when users chose a computer system, they ran the risk of having everything they purchased becoming obsolete – thus causing great consumer anxiety. This model is illustrated in the figure below.



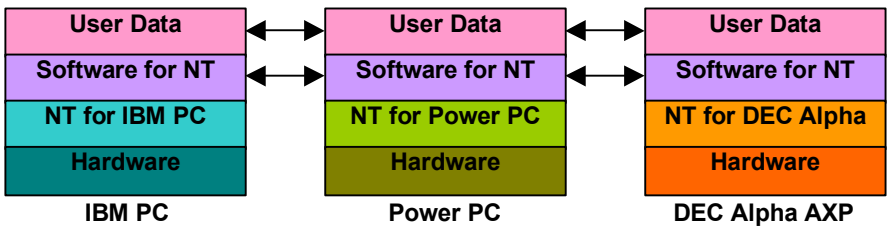
Computer systems were originally 100 percent proprietary in nature

As the industry matured, software developers saw the advantages of offering their products for more than one hardware platform. Seeing no one clear winner in the hardware wars, and a potential expanded customer base, the first examples of compatibility came from software makers. Bridging of disparate technologies began with the ability to transfer data between systems as illustrated in the figure below.



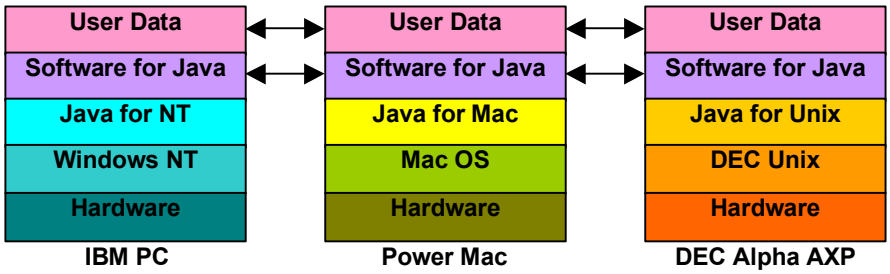
The first step towards compatibilty came from software makers, allowing shared data

Microsoft took compatibility a step further when it offered Windows NT, a cross-platform operating system for the IBM PC, PowerPC, and DEC Alpha AXP hardware platforms. The advantage to users was that once they chose their hardware platform, and installed Windows NT, their software applications would be transferable among systems. The idea was appealing, as shown in the figure below, but Windows NT could not deliver on many of its promises and thus never truly fulfilled its original vision.



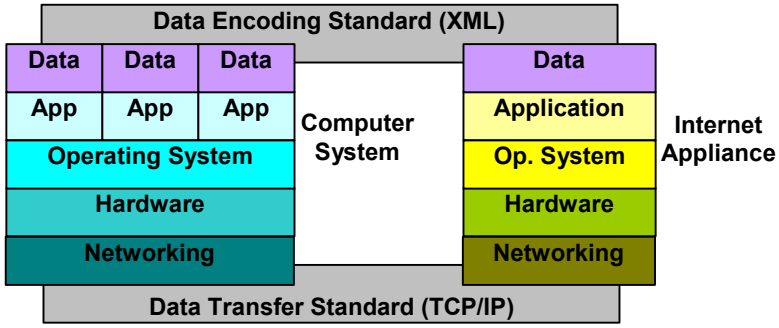
A considerable step forward was made when Windows NT was released, allowing shared software. Unfortunately, Window NT did not attain its aggressive goals.

Another bold attempt at creating greater compatibility came from Sun Microsystems in 1995 with the introduction of Java. This development platform offered a totally new operating environment that would run on any operating system. Software developers would then use the Java programming language to create applications that run in the Java operating environment. Given this "write once, run anywhere" promise, and the added ease of creating network applications in the up-and-coming Internet world, it was easy to understand why Java experienced explosive adoption during its first few years. However, as the figure below illustrates, Java introduces another layer of overhead to a computer system and does little to address inherent problems with legacy applications and operating systems.



Java provided another approach to sharing software. It was less aggressive than Windows NT, but ultimately more successful at achieving truly cross-platform compatibility

As the World Wide Web grew in function and use over the last seven years, it presented unavoidable problems for the computer industry and the industry's attempts to solve the compatibility issue. Computers were no longer the only devices being connected to the Internet, and compatibility solutions did not always make sense for non-computer devices. High-overhead approaches like Java are not feasible for cellular telephones, for example. As such, the industry shifted its thinking and focus to the problem of *data encoding*. It would appear that the best hope is to draw from the common use of the Internet communications infrastructure (the giant TCP/IP network), and develop a standard method of labeling data to be used by all types of applications. As can be seen in the figure below, this "band-aid" serves as the current solution to the compatibility problem.



The industry has now come to a "compromise" position in achieving compatibility by attempting standardized data encoding and data transmission. The resultant effect is still the same – no true interoperability, increased overhead, greater instability, and no real solution

Under this approach, less emphasis is being placed on hardware platforms, operating systems, and even applications used. Instead, the focus is on establishing standards for creating somewhat universal data files for which any application or device can make use. The popularity of the Web and its HTML encoding standard (HyperText Markup Language) worked as the catalyst for XML (eXtensible Markup Language). It is a logical evolution. A Web page could encode its content, stream it over the network and reproduce itself on another computer just because the format was commonly understood in the software. So why not take it further and use this method as a means of storing all types of application data? To its credit, XML has helped to bring about a great deal of the business-to-business (B2B) capabilities in use today.

LESSONS LEARNED FROM THE PAST

The current direction of technology and its application, although simplified in the description above, raises concerns. After almost 30 years of personal computing and almost a decade of mainstream network computing, problems with compatibility, consumer privacy, security, and expanding overhead of maintaining the software infrastructure still exist. All the "bells and whistles" added to applications and devices over the years have not addressed the most fundamental issues challenging computing and communications. Progress towards technology utopia is obstructed by several issues, including:

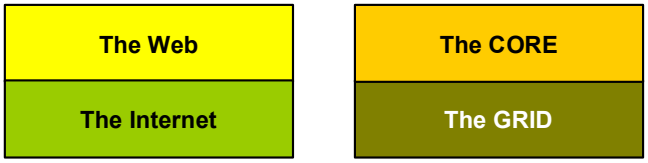
- **Attempts at offering "end-all, be-all" programming languages and development systems.** Every software application is written with some type of programming language. There has never been a programming language that fits every need, and companies are not going to throw away millions of dollars worth of products and solutions developed under a different language to start all over from scratch with a new one. It is possible to offer holistic development systems, but not at the peril of programmatic individual freedom.
- **The continued "Tower of Babel" environment where every device and application has its own way of communicating and functioning.** The World Wide Web has become the destination of every application refugee ever imagined. The problem is, the Web was not originally designed to handle most of the "features" that are being pushed today. The result is a "layered sediment" of technology where the strength of a new offering is as weak as the layers it was built upon. These are the foundations of today's most threatening security risks, infrastructure management costs, and stability problems.
- **Ever-improving software applications that do more and more in each new release.** The difference between the original Microsoft Word program and that offered under Microsoft Office 2002 is phenomenal. It has everything one would need to create and publish a document. However, the addition of extra "formatting" features has lowered productivity of basic workplace users, who spend more time on look-and-feel issues and application management than on content itself. This is not a simple case of better self-management. It is about the complicated rhythms of a cutthroat marketplace and attempts to obscure technology weaknesses.
- **Revolutionary technology introductions that partake in exclusion practices.** Several years ago, a new operating system called BeOS was introduced. Impressive in its design, it failed to catch on in the market because when Be, Inc. abandoned current practices at the time, they were left with no applications to run on the new operating system. This left the product virtually useless, until recently when business-oriented applications finally started to appear. It took almost a full decade to get a reasonable amount of software for BeOS, and its market share is negligible compared to that of Linux, Mac OS, or Windows.
- **Propagation of closed standards and monopolistic domination practices.** Microsoft wants the world to accept Windows as the default operating system. It practically has this position now. But there are serious issues that will prevent a proprietary, privately controlled commercial standard from becoming universally adopted – the most important of those being trust and conflicts of interest. Microsoft has been accused of hiding special functions in their platforms that only they know about. If this is true, Microsoft products have an advantage over competing products running on Windows. For a truly acceptable standard to arise, you must eliminate these conflicts of interest – you must cease competing against your customers.
- **Continuation of politically dominated consortium bureaucracies.** Governing bodies such as the World Wide Web Consortium (W^3C) offer management of technology standards by industry participants. Although the smallest contributors may have a voice, these bodies are highly political and bogged down in bureaucracy. Case in point: The mobile community continues to plead for a compact version of XML that would be useful for mobile devices. It has not happened. Consortiums then find themselves with break-off factions attempting to solve these problems. This is somewhat analogous to the history of the Unix operating system. Today, there are over 14 versions of Unix, including Linux, with very little compatibility between the versions.

So the challenge facing companies and product manufacturers in the Information Age is not one of vision, but one of human nature. Consider the computing "utopia" we see in the Star Trek series. With only the writers' imaginations to limit them, the crew of the Enterprise enjoys *ubiquitous computing*, a state of existence where truly disparate types of systems seamlessly interact with one another as well as with people. It does not matter where the ship's captain may be – whether on the bridge, his quarters, or the holographic recreation room – he can communicate with anyone and anything, reconfiguring and rerouting computers and control systems within a secure and stable environment.

With limited exception, this vision is obtainable. But today's hodgepodge of technologies provides only a glimmer of the brilliance that could be achieved by truly ubiquitous and distributed computing. While the advancements in "shop from home" capabilities are promising, they leave the consumer vulnerable to misuse, even theft of private information. Viruses, bred to invade and corrupt personal information stored on systems, are becoming increasingly dangerous and pervasive. The Internet brings so much promise, yet so much risk at the same time.

A New Model for Computing

Zeratec's five years of extensive research and development produced a powerful new model for computing and communications. This model is called the *CORE Metatecture* and it is the blueprint that Zeratec uses to build its applications and technologies. The CORE Metatecture specifies what would be equivalent to today's network infrastructure (the Internet) as well as the application environment (the Web).



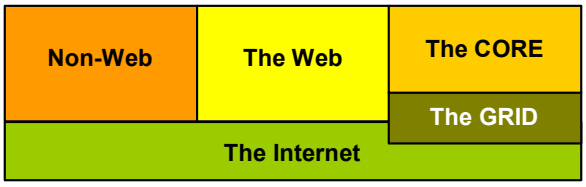
The CORE Metatecture specifies both a new computing environment as well as the underlying infrastructure

The *CORE (Collective Open Resource Environment)* is superior to the Web in that it treats all applications, devices, and information similarly. This creates a level of universal compatibility known as *interoperability*. All of the things that exist in the CORE are called *Entities*. CORE Entities have standard meaning that is understood by the computing environment – allowing the computer to act more intelligently on a person's behalf. This feature is known as *contextuality*. These abilities, as well as many others, are why Zeratec refers to the CORE as the "next-generation Web" because it goes far beyond what is currently possible.

The *GRID (Global Resource Infrastructure Distribution)* is a new type of network infrastructure that goes well beyond what the current Internet provides. The GRID implements extreme *security* at its lowest levels, providing superior protection for users and systems. The GRID also provides for location-independent computing, a required attribute for *single sign-on* capabilities. These features, as well as many others, are what many experts predict the future Internet will look like. Zeratec just happens to have this functionality today.

FITTING IN WITH EXISTING SYSTEMS

Zeratec made sure in its research and development that the CORE and the GRID could be implemented along with today's products and technologies. The company focuses a great deal of its development efforts on providing complete compatibility with the Web and the Internet. This is because trends show that non-Web applications are more often migrating towards these two technologies. Thus, by accommodating the Web, Zeratec accommodates the majority of existing solutions.



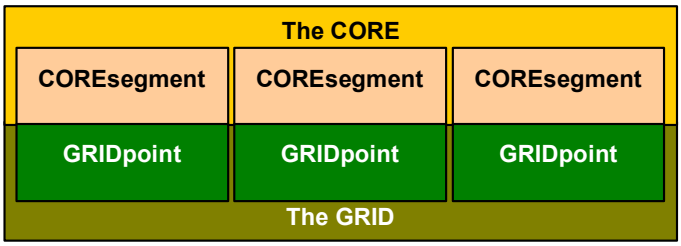
The CORE and the GRID are capable of full integration with the Web and Internet

The Internet (or more accurately the Internet protocols) has become the backbone of almost every computing solution requiring a network, and certainly this is the case for Web-based products. Therefore, Zeratec sought to take advantage of as much of the Internet's strengths as possible. The GRID works "on top" of the Internet in that it uses its base protocols to handle much of the GRID's communication needs.

The CORE, while being a new type of computing environment, is also compatible with the Web and can exchange information back and forth. But, since the Web cannot perform all CORE capabilities, there is a limitation to how much CORE-compliant computing can be done from within the Web. However, there is no limitation to what amount of Web computing can be done from within the CORE. This design strategy enables Zeratec's technology to expand at a rate the industry can accept while not stifling the company's ability to do business.

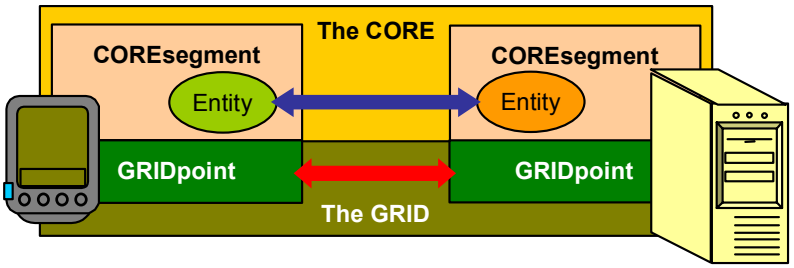
POWERING THE ZERATEC PRODUCTS

As the term reflects, the CORE is the *Collective* Open Resource Environment. That is, it is the whole of all CORE-based applications and devices. The CORE and the GRID, much like the Web and the Internet, are actually composed of several contributing systems and connections. The CORE is made up of one or more *COREsegments* and the GRID is composed of one or more *GRIDpoints*. Wherever there is a GRIDpoint, there must be a COREsegment and vice versa, whether the system is a personal computer, an appliance, or a handheld device such as a cellular telephone or personal digital assistant (PDA). The combination of a COREsegment and GRIDpoint on a single system is known as the *Zeratec Virtual Machine* (ZVM).



The CORE and the GRID are actually the collective sum of their COREsegment and GRIDpoint parts

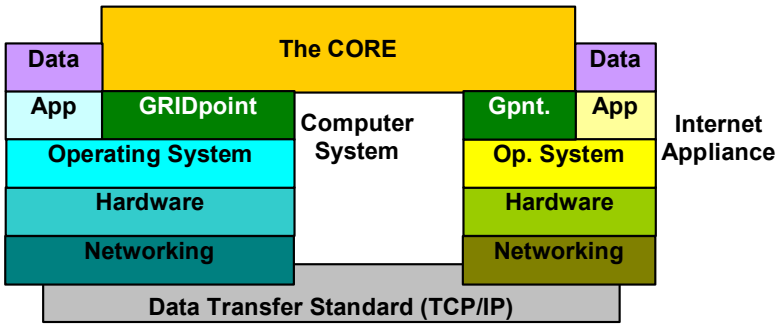
ZVMs work in concert with one another to achieve the requirements of the user based on the security arrangements of their respective configurations. As illustrated in the figure below, if the user of a personal computer has allowed the user of a PDA to access the PC's COREsegment, then CORE Entities can be transferred back and forth between the two COREsegments by their GRIDpoints.



COREsegments and GRIDpoints provide a complete and secure environment

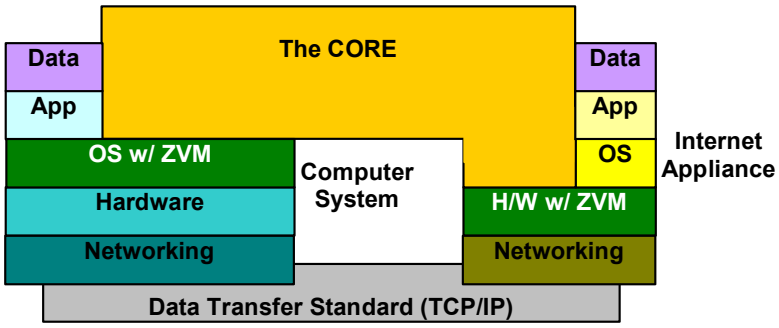
REVOLUTION BY EVOLUTION

Zeratec's use of its virtual machine, in addition to providing technically superior results, is also strategic for the company's mid-term and long-term developments. This approach will permit the transformation of technology outside the CORE without disturbing what has been already established. In other words, the *Logical Model* of the CORE and the ZVM will go unchanged, while the *Physical Model* may evolve quite drastically. The following figure illustrates how the CORE and the ZVM are implemented on existing computer systems.



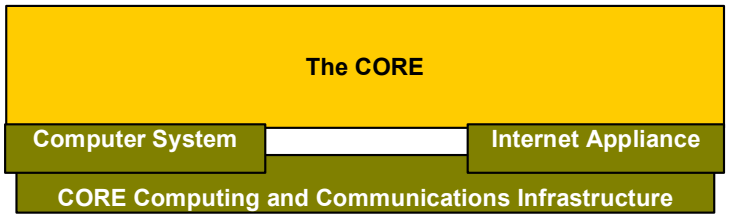
An example of physical implementation on today's systems and devices

As can be seen, ZVMs create the logical CORE – a seamless fabric of cyberspace. As the benefits of the CORE Metatecture are adopted by the industry, the responsibilities of the ZVM can be implemented further into operating systems as well as directly into hardware. The figure below shows a computer system with a CORE-enabled operating system and a native CORE-enabled hardware device.



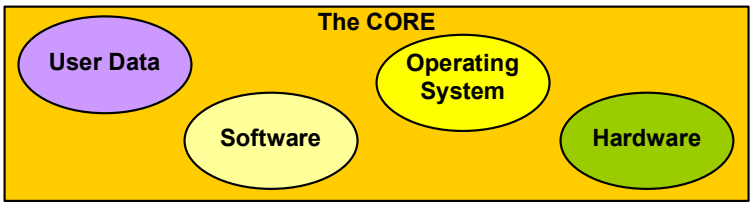
An example of "second-generation" CORE implementations

The support of CORE requirements does not exclude a system from continuing to support legacy operating systems and applications. But it does set the stage for even further evolutions in these technologies. The ultimate implementation of the CORE and the GRID bring the required services directly into the networking infrastructure itself, offering whole new possibilities for hardware and software. The figure below illustrates the strongest possible implementation of the CORE Metatecture.



An example of "third-generation" CORE implementations

It is at this point where the GRIDpoints and COREsegments natively permeate the computing and communications grid, and connecting systems, devices, and appliances strategically share in the responsibilities of maintaining the CORE and the Entities within. However, as previously stated, while this evolution occurs, the Logical Model remains the same. The figure below illustrates that CORE Entities are oblivious to changes in the Physical Models that support them. This provides a highly acceptable migration into the new paradigm of the CORE Metatecture.



The unchanging logical model of the CORE

Forming the Business Case

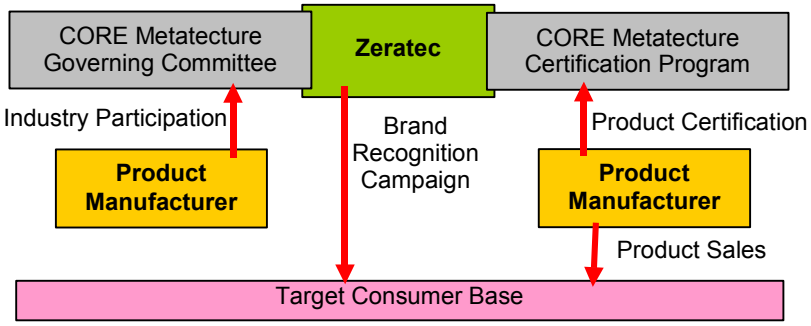
Technologically speaking, the high-tech industry is in serious need of a new standard as powerful as the CORE Metatecture. From a business perspective, given that Zeratec could license the use of the CORE Metatecture to all types of product manufacturers, the company stands to gain tremendous financial returns. However, the adoption of a new standard does not occur on technical superiority alone. Zeratec must also address such issues as political agendas (both private and governmental), proprietary jealousies, monopolies, and currently invested adoptions by Corporate America, the government, and beyond.

HOW TO HOST THE NEW STANDARD

The first step in successfully providing a new computing standard is to develop a strong management model. Zeratec will "openly manage" the CORE Metatecture, classifying it as a *Marketed Open Standard*. This classification explains that product manufacturers that make use of the CORE Metatecture will enjoy the benefits of Zeratec's marketing efforts to the consumer population on their behalf. This is analogous to the "Intel inside" program. By building consumer awareness of Intel's superior chipsets, the products that bear the Intel logo receive greater recognition and success. Zeratec will also implement a program for certification and branding of products with a *CORE Certified* mark.

As an *open* standard, Zeratec will govern the evolution of the metatecture with industry participation. This is in much the same way that existing consortiums operate except that Zeratec will provide oversight to prevent splintering factions from developing and unfair practices of political bullying among larger and stronger members. The Zeratec management model provides all of the features that are desirable to consumers and product manufacturers alike:

- Allows all ideas to be heard and considered
- Greater expediency for desired technological progress
- Less concern over "offshoots" of the standard
- No unfair advantage for any product manufacturer
- Better and unified marketing to the consumer population
- Clear compliance marking through a *CORE Certified* program



The Zeratec management model is appropriate for the industry and the consumer

An Evolving Business Model

Realistically, the ability of Zeratec to ultimately serve as a standards bearer is dependent upon its ability to "stair step" into the position. The logic can be easily seen by working backwards. The target of the CORE Metatecture is

all types of product manufacturers. None of these targets will seriously adopt the new standard and see the value in certification without the existence of development tools to ease in the creation of new CORE-based products, thereby making an impact of a business's bottom line.

Further, even with development tools in existence, a product manufacturer is unlikely to take on a new computing model in their product designs without having seen it perform in other products first. For the product manufacturers to make the commitment, they need a level of comfort in the "road-tested" standard, a sense that they will not be "going it alone," and clear value proposition in doing so. Zeratec will meet these criteria and more when appropriate. The first task is to focus on the development of proof regarding the superior nature of the CORE Metatecture. Thus, Zeratec has developed an evolving business model.

This phased approach to growing Zeratec's business model is quite prudent. It lowers the overall risk to the company, allows it to build credibility faster and generate revenues more quickly. The strategy conforms to typical business planning strategies while also growing a revolution in the process.

In a Nutshell

The ultimate target of Zeratec's CORE technology – the evolution of the global computing and communications infrastructure – is one of the most significant and substantial opportunities to present itself in several years. The Internet and other types of computing infrastructures are commonly thought of as a *commodity*. In fact, the computing and communications infrastructure is too immature for this classification, and treating it as such is exactly what has brought about its pending failure as a whole with respect to serving as a ubiquitous platform.

Product manufacturers and consumers alike may not be able to articulate what they believe is required to bring about "Star Trek"-like capabilities, but they will know it when they see it. Zeratec must provide that clear vision and understanding. It is a change from current methods of thought, a *paradigm shift*, but like other shifts in thinking, once understanding is achieved whole new levels of innovation, productivity, and economic growth occur. Zeratec must not only provide the vision, but a "politically" acceptable business model to proliferate the vision.

Economic and social realities must also be taken into account because the high-tech market has incurred a considerable credibility hit with the "dot com" fallout. Investors, consumers, and businesses alike continue to act more cautiously and conservatively towards new ideas. Justified or not, adding this mindset to the post-"September 11" environment, creates an amount of pessimism that must be overcome. In time, as economic growth rates rebuild, so will consumer confidence and optimism.

Thus Zeratec's technology development concentrates initially on applications that will demonstrate prowess and new capabilities. These products must encompass as much existing technology as possible – an *embrace and extend* technique – so as to carefully meet expectations of risk-adverse buyers. The company's initial product offerings must also touch on *compatibility* issues such as being "cross-platform" and achieving "interoperability." But in building these solutions, the company must not waiver on its vision of the CORE Metatecture; it cannot compromise key principles that make it stand out from the crowd.

Technology development must also produce solutions that live at various levels of existing paradigms. Since personal computer hardware does not naturally support CORE capabilities, Zeratec must build technologies that implement the proper environment at higher levels. In doing so, it must plan ahead for the point where CORE capabilities can exist natively on hardware. This is not difficult for the CORE Metatecture because it was designed as a computing *methodology* – one that could be applied to any existing technology. This strategy is part of how the company shows *"where tomorrow leads"* without forgetting what has been done yesterday and today.